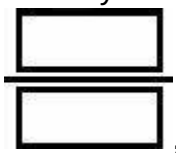
A rithm etic

For questions in the Q uantitative C om parison form at (“Q uantity A ” and “Q uantity B ” given),the answ er choices are alw ays as follow s:

(A) Q uantity A is greater.
(B) Q uantity B is greater.
(C) The tw o quantities are equal.
(D) The relationship cannot be determ ined from the inform ation given.

For questions follow ed by a num eric entry box  ,you are to enter your ow n answ er in the box.For questions follow ed by fraction-style num eric entry boxes  ,you are to enter your answ er in the form of a fraction.Y ou are not required to reduce fractions.For exam ple,if the answ er is 1/4,you m ay enter 25/100 or any equivalent fraction.

A ll num bers used are real num bers.A ll figures are assum ed to lie in a plane unless otherw ise indicated.G eom etric figures are not necessarily draw n to scale.Y ou should assum e,how ever,that lines that appear to be straight are actually straight,points on a line are in the order show n,and all geom etric objects are in the relative positions show n.C oordinate system s,such as *xy*-planes and num ber lines,as w ell as graphical data presentations such as bar charts,circle graphs,and line graphs, *are* draw n to scale.A sym bol that appears m ore than once in a question has the sam e m eaning throughout the question.

1.

Q uantity A	**Q uantity B**
39 - (25 - 17)	39 - 25 - 17

2.

Q uantity A	**Q uantity B**
14 - 3(4 - 6)	(4)(-3)(2)(-1)

3.

Q uantity A	**Q uantity B**
-5 × 1 ÷ 5	-6 × 1 ÷ 6

4.5 - (4 - (3 - (2 - 1))) =

5.

Q uantity A	Q uantity B
17(6) + 3(6)	6(17) + 6(3)

6.

Q uantity A	Q uantity B
$-2^3/2$	$(-2)^2$

7.

Q uantity A	Q uantity B
$5^3 - 5^2$	5

8.

Q uantity A	Q uantity B
$-10 - (-3)^2$	$-[10 + (-3)^2]$

9.32/(4 + 6 × 2) =

(A) 8/5
(B) 16/5
(C) 2
(D) 20
(E) 28

10.

Q uantity A	Q uantity B
(30,000,000)(2,000,000)	(15,000,000)(4,000,000)

11.W hat is the sum of the num bers in the grid below ?

−2	−1	1	2	3	4
−4	−2	2	4	6	8
−6	−3	3	6	9	12
−8	−4	4	8	12	16
−10	−5	5	10	15	20
−12	−6	6	12	18	24

12.M itchell plans to w ork at a day cam p over the sum m er.Each w eek,he w ill be paid according to the follow ing schedule: at the end of the first w eek,he w ill receive $1.A t the end of each subsequent w eek,he w ill receive $1 plus an additional am ount equal to the sum of all paym ents he's received in previous w eeks.H ow m uch m oney w ill M itchell be paid in total during the sum m er,if he w orks for the entire duration of the 8-w eek-long cam p?

$

13.

A book w ith 80,000 w ords costs $24 and a short story has 1,000 w ords and costs $1.

Q uantity A	**Q uantity B**
Price per w ord of the book	Price per w ord of the short story

14.A taxi driver m akes $50 an hour,but pays $100 a day rent for his taxi and has other costs that am ount to $0.50 per m ile.If he w orks three 7-hour days and one 9-hour day and drives a total of 600 m iles in one w eek,w hat is his profit?

(A) $700
(B) $800
(C) $1,100
(D) $1,200
(E) $1,500

15.

Ticket Prices at the Natural History Museum

	Weekdays	Weekends & Holidays
Child (ages 5–18)	$7	$9
Adult (ages 19–64)	$14	$16
Senior (ages 65+)	$8	$10
*Children under age 5 attend free		

M r.and M rs.G onzales,ages 42 and 39,w ish to visit the N atural H istory M useum w ith their three children (ages 4,6,and 10),and M r.G onzales's 69-year-old father.

Q uantity A	**Q uantity B**
The cost of adm ission for the group on a w eekday	The cost of adm ission for the group on a w eekend after applying a coupon offering $10 off the total purchase

16.

O n a certain train,children's tickets cost $6 and adult tickets cost $9.Six people are charged betw een $44 and $50,total,for their tickets.

Q uantity A	**Q uantity B**
The num ber of children in the group	The num ber of adults in the group

17.If tw ice 4,632 is divided by 100,w hat is the tenths digit?

18.If 617 is divided by 49,the sum of the tens digit and the tenths digit is equal to

(A) 1
(B) 5
(C) 6
(D) 7
(E) 9

19.

Q uantity A	**Q uantity B**
The age at death,in years and days,of a person w ho lived from January 31,1817 to January 15,1901	The age at death,in years and days,of a person w ho lived from January 15,1904 to January 31,1988

20.For the m onth of M ay,A li's C offee Shop is offering a "buy five drinks get one free" special,and B ob's C offee Shop is offering 20% off all drinks.A t both shops,the regular price of a coffee is $2.25.

Q uantity A	Q uantity B
The total cost of one coffee per day from A li's for every day of M ay	The total cost of one coffee per day from B ob's for every day of M ay

21.In a certain ancient kingdom ,the length of a foot w as the length of the current king's foot.If the new ly crow ned m onarch had a 12 inch foot as opposed to the 10 inch foot of his predecessor,a form erly 300 foot fence w ould now have a length of how m any feet? (A ssum e that the length of an inch rem ains constant.)

(A) 250
(B) 302
(C) 350
(D) 360
(E) 400

22.M ary has six m ore tapes than Pedro.If Pedro gives tw o tapes to John and then Pedro buys 5 new tapes,how m any m ore tapes does M ary have than Pedro?

(A) 3
(B) 4
(C) 5
(D) 6
(E) 7

23.25 em ployees donated a total of $450 to charity.If 15 em ployees donated at least $12 and 9 em ployees donated at least $19,w hat is the m axim um am ount,in dollars,that the last em ployee could have donated?

$ [ ]

24.M aribel m ust divide 60 candies am ong herself and her 12 cousins,although there is no requirem ent that the candies be divided equally.If M aribel is to have m ore candies than everyone else,w hat is the least num ber of candies she could have?

[ ]

25.

Softies Facial Tissues com e 84 to a box for $2.99.
Enviro Facial Tissues com e 56 to a box for $1.89.

Q uantity A	Q uantity B
The positive difference betw een the per-tissue cost of Softies tissues and the per-tissue cost of Enviro tissues	0.2 cents

26.A tank has a capacity of 200 pints.H ow m any gallons of w ater w ould it take to fill the tank to 3/10 of its capacity? (1 gallon = 8 pints) gallons

[ ] gallons

27.

(1 kilogram = 2.2 pounds)

Q uantity A	**Q uantity B**
The num ber of kilogram s in 44 pounds	The num ber of pounds in 44 kilogram s

28.If the form ula for converting degrees Fahrenheit to degrees C elsius is $C = \frac{5}{9}(F - 32)$,w hat is *F* w hen *C* = 30?

(A) -10/9
(B) 338/9
(C) 86
(D) 558/5
(E) 112

29.

Q uantity A	**Q uantity B**
The num ber of seconds in 12 hours	The num ber of m inutes in 720 hours

30.Joe's car can travel 36 m iles per gallon of fuel.A pproxim ately how m any kilom eters can the car travel on 10 liters of fuel? (5 m iles = approxim ately 8 kilom eters;1 gallon = approxim ately 4 liters)

[ ] kilometers

31.H ow m any 1-inch square tiles w ould it take to cover the floor of a closet that has dim ensions 5 feet by 4 feet? (1 foot = 12 inches)

(A) 20
(B) 240
(C) 1,440
(D) 2,160
(E) 2,880

32.A pool has sprung a leak and is losing w ater at a rate of 5 m illiliters per second.H ow m any liters of w ater is this pool losing per hour? (1 liter = 1,000 m illiliters)

(A) 3
(B) 6
(C) 12
(D) 18
(E) 24

33.

C hild A ate 3/5 of a kilogram of chocolate and C hild B ate 300 gram s of chocolate.(1 kilogram = 1000 gram s)

Q uantity A	**Q uantity B**
The w eight,in gram s,of the chocolate that C hild A ate	Tw ice the w eight,in gram s,of the chocolate that C hild B ate

34.It takes $4\frac{2}{3}$ feet of w ood to m ake a fram e for a lithograph.If w ood is sold at $5 a yard and only by the yard,and a collector needs to m ake 4 fram es,how m uch w ill the w ood cost? (1 yard = 3 feet)

(A) $23.33
(B) $25
(C) $33.33
(D) $35
(E) $100

35.O ut of 5.5 billion bacteria grow n for an experim ent,1 in 75 m illion has a particular m utation.A pproxim ately how m any of the bacteria have the m utation?

(A) 7 (B
) 73 (C)
733
(D) 7,333
(E) 73,333

36.A particular nation's G D P (G ross D om estic Product) is $4.5 billion.If the population of the nation is 1.75 m illion,w hat is the per capita (per person) G D P,rounded to the nearest dollar?

(A) $3
(B) $25
(C) $257
(D) $2,571
(E) $25,714

37.G lobal G D P (G ross D om estic Product) w as $69.97 trillion in 2011.If the w orld population for 2011 w as best estim ated at 6,973,738,433,approxim ately w hat is the global G D P per person?

(A) $10
(B) $100
(C) $1,000
(D) $10,000
(E) $100,000

38.The distance betw een M ercury and Earth changes due to the orbits of the planets.W hen M ercury is at its closest point to Earth,it is 48 m illion m iles aw ay.W hen M ercury is at its furthest point from Earth,it is 138 m illion m iles aw ay.For a science project,R uby calculates the m axim um and m inim um am ount of tim e it w ould take to travel from Earth to M ercury in a spacecraft traveling 55 m iles per hour.A pproxim ately w hat are the tim es,in days?

(A) 3,636 and 10,454
(B) 14,545 and 41,818

(C) 36,364 and 104,545
(D) 87,272 and 250,909
(E) 872,727 and 2,509,091

A rithm etic A nsw ers

1.**(A).**First sim plify inside the parentheses:

39 - (25 - 17) =
39 - 8 =
31

Y ou could also distribute the m inus sign to get 39 - 25 + 17 if you prefer.Q uantity B is equal to -3,so the final answ er is (A).If you noticed right aw ay that the m inus sign w ould distribute in Q uantity A but not Q uantity B ,you could have picked (A) w ithout doing any arithm etic.

2.**(B).**This question is sim ply testing PEM D A S (Parentheses/Exponents,then M ultiplication/D ivision,then A ddition/Subtraction),at least in Q uantity A .M ake sure that you sim plify inside the parentheses,and then m ultiply, before subtracting:

14 - 3(4 - 6) =
14 - 3(-2) =
14 + 6 =
20

Q uantity B sim ply equals (4)(-3)(2)(-1) = 24.

3.**(C).**The quantities are equal.N ote that

-5 × 1 ÷ 5
= -5 ÷ 5 =
-1

In Q uantity B :

-6 × 1 ÷ 6
= -6 ÷ 6 =
-1

4.**3.**M ake sure to begin w ith the innerm ost parentheses:

5 - (4 - (3 - (2 - 1))) =
5 - (4 - (3 - 1)) =
5 - (4 - 2) =
5 - (2) =
3

5.**(C).**A ccording to the distributive property,the tw o quantities are the sam e.O r:

17(6) + 3(6)
= 102 + 18 =
120

In Q uantity B :

6(17) + 6(3) =
102 + 18 =
120

6.**(B).**In Q uantity A ,the exponent should be com puted before taking the negative of the value — in accordance w ith PEM D A S.

In Q uantity B :

$(-2)^2$ =
(-2)(-2)
= 4

7.**(A).**D o not m ake the m istake of thinking that $5^3 - 5^2 = 5^1$.Y ou m ay not sim ply subtract the exponents w hen you are subtracting tw o term s w ith the sam e base! O bserve:

$5^3 - 5^2$ =
125 - 25 =
100

O bviously,Q uantity A is m uch larger.A lternatively,you could factor out 5^2 (this is an im portant technique for larger num bers and exponents w here pure arithm etic w ould be im practical):

$5^3 - 5^2$ =
$5^2(5^1 - 1)$ =
$5^2(4)$ =
100

8.**(C).**In Q uantity A :

$-10 - (-3)^2$
= -10 - (9)
= -19

In Q uantity B :

$-[10 + (-3)^2]$
$-[10 + (-3)^2]$
= -[10 + (9)]
= -19

9.**(C).**B egin inside the parentheses and — in accordance w ith PEM D A S — sim plify 6 × 2 first:

32/(4 + 6 × 2)
= 32/(4 + 12)
= 32/(16) = 2

10.**(C).**The G R E calculator w ill not be able to handle that m any zeroes.Y ou w ill w ant to do this calculation by hand. To m ake things easier,you could cancel as m any zeroes as you w ant,as long as you do the sam e operation to both sides.For instance,you could divide both sides by 1,000,000,000,000 (just think of this as “1 w ith tw elve zeroes”),to get:

Q uantity A	**Q uantity B**
(30)(2)	(15)(4)

O r,just use a bit of logic: 30 m illion tim es 2 m illion is 60 m illion *m illion*,and 15 m illion tim es 4 m illion is also 60 m illion *m illion*.(A “m illion m illion” is a trillion,but this doesn’t m atter as long as you’re sure that each Q uantity w ill have the sam e num ber of zeroes.)

11.**147.**There are several patterns in the grid,depending on w hether you look by row or by colum n.W ithin each row , there are positive and negative term s at the beginning that cancel each other.For exam ple,in the first row ,you have -2 + 2 = 0 and -1 + 1 = 0.The only term s in the first row that contribute to the sum are 3 and 4,in the far-right colum ns. The sam e is true for the other row s.

Thus,the sum of the grid is equal to the sum of only the tw o far-right colum ns.The sum in the first row in those colum ns is 3 + 4 = 7;the sum in the next row is 6 + 8 = 14,etc.The sum in the final row is 18 + 24 = 42.Sim ply add 7 + 14 + 21 + 28 + 35 + 42 in your calculator to get 147.

12.**255.**A t the end of the first w eek,M itchell receives $1.A t the end of the second w eek,he gets $1,plus $1 for the total he had been paid up to that point,for a total of $2.A t the end of the third w eek,he gets $1,plus ($1 + $2),or $3, for the total he had been paid up to that point,so this third w eek total is $4.Let’s put this in a table:

W eek #	P aid this w eek($)	C um ulative P ay including this w eek ($)
1	1	1
2	1 + 1 = 2	1 + 2 = 3
3	1 + 3 = 4	3 + 4 = 7
4	1 + 7 = 8	7 + 8 = 15
5	1 + 15 = 16	15 + 16 = 31
6	1 + 31 = 32	31 + 32 = 63
7	1 + 63 = 64	63 + 64 = 127
8	1 + 127 = 128	127 + 128 = 255

13.**(B).**In Q uantity A ,24/80,000 = 0.0003,or 0.03 cents per w ord.In Q uantity B ,1/1,000 = 0.001,or 0.1 cents per w ord.Q uantity B is m uch larger.N ote that your calculation w as not strictly necessary — it w ould have been m ore

efficient to notice that the book costs 24 tim es the story but has 80 tim es the w ords.(Then rem em ber to choose the larger am ount!)

14.**(B).**The driver w orks 3 days × 7 hours per day,plus a 9-hour day,for a total of 30 hours.A t $50 an hour,he m akes $1,500 but pays $400 in rent and $300 in m ileage expenses.$1,500 - $700 = $800.

15.**(C).**Y ou don't actually need to do a lot of tedious arithm etic to answ er this problem .Six people w ill be attending the m useum ,but the 4-year-old does not require a ticket (kids under 5 are free).Thus,5 tickets need to be purchased, w hether the fam ily attends on a w eekday or a w eekend.

N otice that all of the w eekend tickets are each $2 m ore expensive.Therefore,buying 5 w eekend tickets w ill cost a total of $10 m ore.Thus,after the $10-off coupon,the tw o quantities are the sam e.

16.**(D).**Even though the range of costs ($44 to $50) is fairly sm all,there is still m ore than one possibility.A good w ay to w ork this out is to start w ith the sim plest scenario: 3 adults and 3 kids.Their tickets w ould cost 3(9) + 3(6) = $45.That's in the range,so it's one possibility.

Since kids are cheaper,you don't w ant to add m ore kids to the m ix (2 kids,4 adults w ill give you too sm all a total),but try sw itching out 1 kid for 1 adult.

For 4 adults and 2 kids,tickets w ould cost 4(9) + 2(6) = $48.Thus,Q uantity A and Q uantity B could be equal,or Q uantity B could be larger,so the answ er is (D).

17.**6.**M ultiply 4,632 by 2 to get 9,264,then divide by 100 to get 92.64.The **tenths** digit is 6.(D o not confuse **tenths** w ith **tens**.The tens digit is 9.)

18.**(C).**D ivide 617 by 49 in your calculator to get 12.5918… .The **tens** digit is 1.The **tenths** digit is 5.The answ er is 1 + 5 = 6.

19.**(B).**For Q uantity A ,subtract 1901 - 1817 to get 84 years.H ow ever,this person lived from January 31,1817 to January 15 (not January 31),1901,so you m ust subtract the days from January 16 to January 31,or 16 days.

For Q uantity B ,subtract 1988 - 1904 to get 84 years.H ow ever,the person lived from January 15,1905 to January 31 (not January 15),1988,so add 16 days.

The person in Q uantity A lived alm ost 84 years.The person in Q uantity B lived 84 years,plus a bit m ore.Q uantity B is larger.

A fter calculating that both persons lived roughly 84 years you could also notice that all w ithin the sam e m onth (though in different years),the person in Q uantity B w as born earlier in the m onth and died later in the m onth than the person in Q uantity A ,m eaning the person in Q uantity B lived for m ore of that m onth.

20.**(A).**The actual price ($2.25) of the coffee is irrelevant,and no actual calculation is required here.A ll that's needed to solve this problem is to realize that B ob's is a m uch better deal.

20% off each coffee is 1/5 off."B uy five drinks get one free" m eans that,for everything six drinks one purchases,the

last one is free.That's one in SIX drinks free,or 1/6 off.

So,provided that everything else (the regular price of a coffee at both shops,buying the sam e num ber of coffees in the m onth of M ay) is the sam e,one w ill pay less at B ob's than at A li's.Thus,the total cost at A li's is larger.B y the w ay,rem em ber to pick the *larger quantity* (Q uantity A),N O T the "better deal"!

21.**(A).**A fence that m easured 300 feet under the old king's regim e w ould be 300 × 10 = 3,000 inches long.This sam e 3,000-inch fence,under the new king's regim e,w ould be 3,000/12 = 250 feet long.(K eep in m ind that,if a "foot" gets bigger,few er such "feet" fit into a fence of fixed length.)

22.**(A).**Let's m ake a chart for how m any tapes everyone has before they start giving each other tapes or getting new ones.Since M ary has 6 m ore than Pedro:

M ary	Pedro	John
$P + 6$	P	?

N ow ,Pedro gives 2 to John:

M ary	Pedro	John
$P + 6$	$P - 2$	? + 2

N ow ,Pedro buys 5 new tapes.N ote that "P - 2" plus 5 is $P - 2 + 5 = P + 3$.

M ary	Pedro	John
$P + 6$	$P + 3$	? + 2

Y ou never learned very m uch about John,so the question only asks you about M ary and Pedro.M ary and Pedro each have *P* tapes,but M ary has 6 m ore than that and Pedro has 3 m ore than that.So,M ary has 3 m ore tapes than Pedro.

It also w ould be fairly sim ple to assign values to M ary and Pedro (for instance,say that M ary has 10 tapes and Pedro has 4) and proceed using a real-num ber exam ple.

23.**99.**Since you w ant to m axim ize the last em ployee's contribution,m inim ize everyone else's.If 15 em ployees donated at least $12 and 9 em ployees donated at least $19:

$$15(12) + 9(19) = 180 + 171 = 351$$

So,the m inim um that all 24 of these em ployees could have given is $351.Therefore,the m axim um that the 25th em ployee could have given is 450 - 351 = 99,or $99.

24.**6.**O ne good w ay to solve this problem is to first evenly divide the candies,and then give M aribel m ore (by taking candies aw ay from the others) until the conditions of the problem are m et.60 candies divided by 13 people = 4.615… .

So,if M aribel had 5 candies,w ould she have m ore than everyone else? W ell,if the 12 cousins each had only 4 candies,that's 48 candies total plus M aribel's 5 = 53 candies.7 candies are unaccounted for,m eaning that som e other cousin or cousins w ill have to have the sam e as or m ore than M aribel.

If M aribel had 6 candies,w ould she have m ore than everyone else? W ell,if the 12 cousins each had only 5 candies, they w ould have 60.Since there are only 60 candies total,M aribel could have 6 and the other cousins could have 4 or 5 each.The answ er is 6.

K eep in m ind that w hen the question asks for a m inim um ,you can't just go m essing around until you find a case that w orks — to find the *sm allest* case that w orks,you need to start sm all and w ork up from there.

25.**(B).**In the calculator,divide 2.99 by 84 to get a per-tissue cost of 0.03559… ,(or 3.559… cents).

D ivide 1.89 by 56 to get a per-tissue cost of 0.03375… (or 3.375… cents).

Subtract the sm aller num ber from the larger num ber to get 0.00184… ,or 0.184… cents.

This is less than 0.2 cents.The answ er is (B).

26.**7.5 gallons:**

First find out how m any pints 3/10 of the capacity is:

200 × 3/10 = 600/10 = 60

N ow you need to convert pints to gallons:

$$60 \text{ pints} \times \frac{1 \text{ gallon}}{8 \text{ pints}} = \frac{60}{8} = 7.5 \text{ gallons}$$

27.**(B).**To com pare the values,you need to convert the quantity on the left from pounds to kilogram s and the quantity on the right from kilogram s to pounds:

Quantity A	Quantity B
$44 \text{ pounds} \times \frac{1 \text{ kilogram}}{2.2 \text{ pounds}}$	$44 \text{ pounds} \times \frac{2.2 \text{ pounds}}{1 \text{ kilogram}}$

B efore actually m ultiplying,notice that the quantity on the left is divided by 2.2,w hile the quantity on the right is m ultiplied by 2.2.The quantity on the right w ill be greater.

O ne could also solve this by noticing that the tw o quantities involve reverse calculations,w ith the sam e num ber of units (44).Since a kilogram is heavier than a pound,it takes m ore of the lighter pounds to equal 44 heavier kilogram s than it takes of the heavier kilogram s to equal 44 of the lighter pounds.

28.**(C).**Start by plugging 30 in for *C* in the equation:

$$30 = \frac{5}{9}(F - 32)$$

N ow isolate *C* .B egin by m ultiplying both sides by 9/5:

$$30 = \frac{5}{9}(F - 32)$$

$$\frac{9}{5} \times 30 = F - 32$$

To m ultiply 30 by 9/5 quickly,reduce before m ultiplying:

$$\frac{9}{5} \times 30 = F - 32$$

$$\frac{9}{1} \times 6 = F - 32$$

$$54 = F - 32$$

$$86 = F$$

29.**(C).**B efore doing either calculation,note that there are 60 seconds in a m inute and 60 seconds in an hour. C om pare the tw o calculations:

12 hours × 60 m inutes/hour × 60 seconds/m inute 720 hours × 60 m inutes/hour

N otice that 12 × 60 = 720.That m eans that both am ounts w ill equal 720 × 12.The tw o values are equal.

30.**144 kilom eters.**C onvert m iles per gallon to kilom eters per liter by m ultiplying by the conversion ratios such that both the m iles and gallons units are canceled out:

$$\frac{36 \text{ miles}}{1 \text{ gallon}} \times \frac{8 \text{ kilometers}}{5 \text{ miles}} = \frac{288 \text{ kilometers}}{5 \text{ gallons}}$$

$$\frac{288 \text{ kilometers}}{5 \text{ gallons}} \times \frac{1 \text{ gallon}}{4 \text{ liters}} = \frac{288 \text{ kilometers}}{20 \text{ liters}} = \frac{14.4 \text{ kilometers}}{1 \text{ liter}}$$

The car has 10 liters of fuel in the tank:

10 liters × 14.4 kilom eters/liter = 144 kilom eters

31.**(E).**There is a hidden trap in this question.R em em ber that the dim ensions of this room are 2 ft ,not ft (because 5 feet × 4 feet = 20 square feet).To avoid this trap,you should convert the dim ensions to inches first,then m ultiply.

5 feet × 4 feet = 60 inches × 48 inches

The dim ensions of the closet in inches are 60 inches by 48 inches,or 60 × 48 = 2,880 square inches.Each tile is 1 square inch,so it w ill take 2,880 tiles to cover the floor.

32.**(D).**To answ er this question,you need to convert m illiliters to liters,and convert seconds to hours.The order in w hich you m ake the conversions does not m atter.First,convert seconds to hours.There are 60 seconds in 1 m inute, and 60 m inutes in 1 hour:

$$\frac{5 \text{ milliliters}}{1 \text{ second}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = \frac{18{,}000 \text{ milliliters}}{1 \text{ hour}}$$

N ow convert m illiliters to liters:

$$\frac{18{,}000 \text{ milliliters}}{1 \text{ hour}} \times \frac{1 \text{ liter}}{1{,}000 \text{ milliliters}} = \frac{18 \text{ liters}}{1 \text{ hour}}$$

33.**(C).**3/5 of a kilogram is 600 gram s.Tw ice 300 gram s is also 600 gram s.The colum ns are equal.

34.**(D).**For 4 fram es,the collector needs $18\frac{2}{3}$ feet or $6\frac{2}{9}$ yards of w ood.Since the w ood is sold “only by the yard,” the collector m ust buy 7 yards [21 feet] at $5 a yard.The answ er is 7(5) = 35.

35.**(B).**O ne good w ay to keep track of large num bers (especially those that w on’t fit in the G R E calculator!) is to use scientific notation (or a loose version thereof — for instance,5.5 billion in scientific notation is 5.5×10^9,but it w ould be equally correct for your purposes to w rite it as 55×10^8).

5.5 billion = 5,500,000,000 = 5.5×10^9
75 m illion = 75,000,000 = 75×10^6

Since 1 in 75 m illion of the bacteria have the m utation,divide 5.5 billion by 75 m illion:

$\frac{5.5 \times 10^9}{75 \times 10^6}$,w hich can also be w ritten as $\frac{5.5}{75} \times \frac{10^9}{10^6}$.O nly $\frac{5.5}{75}$.needs to go in the calculator,to yield 0.0733333… .

Since $\frac{10^9}{10^6}$ is 10^3,m ove the decim al three places to the right to get 73.333… ,or answ er choice (B).

O r,w rite one num ber over the other and *cancel out the sam e num ber of zeroes from the top and bottom* before trying to use the calculator: $\frac{5{,}500{,}000{,}000}{75{,}000{,}000} = \frac{5{,}500{,}\cancel{000{,}000}}{75{,}\cancel{000{,}000}} = \frac{5{,}500}{75} = 73.333\ldots$

36.**(D).**This problem is asking you to divide $4.5 billion by 1.75 m illion.W hen dealing w ith num bers that have m any zeroes,you can avoid m istakes by using scientific notation or by w riting out the num bers and canceling zeroes before using the calculator.

4.5 billion = 4,500,000,000 = 4.5×10^9

1.75 m illion = 1,750,000 = 1.75×10^6

$$\frac{4.5\times10^9}{1.75\times10^6} = 2.57142\ldots\times10^3 = 2,571.42\ldots$$

The answ er is (D).A lternatively,w rite one num ber on top of the other in fully-expanded form ,and cancel zeroes before using the calculator:

$$\frac{4,500,000,000}{1,750,000} = \frac{4,500,00\cancel{0,000}}{1,75\cancel{0,000}} = \frac{450,000}{175} = 2,571.42\ldots$$

37.**(D).**This problem is asking you to divide $69.97 trillion by 6,973,738,433.W hen dealing w ith num bers that have m any zeroes,you can avoid m istakes by using scientific notation or by w riting out the num bers and canceling zeroes before using the calculator.

B efore doing that,how ever,look at the answ ers — they are very far apart from one another,w hich gives you license to estim ate.G D P is about 70 trillion.Population is about 7 billion.Thus:

$$\frac{70,000,000,000,000}{7,000,000,000} = \frac{70,000,\cancel{000,000,000}}{7,\cancel{000,000,000}} = 10,000$$

38.**(C).**Since R ate × Tim e = D istance,thus $\frac{\text{Distance}}{\text{Rate}} = \text{Time}$ = Tim e.

If you don't yet have that form ula m em orized,a little com m on sense w ill tell you that if M ercury and Earth w ere 110 m iles apart,for instance,and you traveled at 55 m ph,you w ould get there in tw o hours.Thus,the correct operation is division.

48 m illion m iles = 48,000,000,so:

$$\frac{48,000,000}{55} = 872,727.2727\ldots$$

138 m illion m iles = 138,000,000,so:

$$\frac{138,000,000}{55} = 2,509,090.909$$

Thus,it w ould take betw een 872,727 hours and 2,509,091 hours (rounded to the nearest hour) to travel to M ercury at 55 m ph.

To convert to **days**,sim ply divide each of these num bers by 24 to get 36,364 days and 104,545 days.